Application No.: 09/682,071

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the

application:

Listing of Claims:

1. (Original)   A computer program product for adjusting the gain of a scanner having

one or more excitation sources, an emission detector having a first gain, and a variable

gain element having a second gain, wherein the computer program product, when

executed on a computer system, performs a method comprising the steps of:

(a) providing a first user interface constructed and arranged to enable a user to

select a user-selected gain value;

(b) receiving the user-selected gain value;

(c) adjusting the first gain based, at least in part, on a first portion of the user-

selected gain value; and

(d) adjusting the second gain based, at least in part, on a second portion of the

user-selected gain value.

2. (Original)   The computer program product of claim 1, wherein:

step (c) includes the steps of

(i) determining the first portion to be equal to a no-change value when the

user-selected gain value is equal to or less than a threshold value, and

2

Application No.: 09/682,071

(ii) determining the first portion to be equal to an excess of the user-selected gain value over the threshold value, when the user-selected gain value is greater than the threshold value; and

step (d) includes the steps of

(i) determining the second portion to be equal to the user-selected gain value when the user-selected gain value is equal to or less than a threshold value, and

(ii) determining the second portion to be equal to the threshold value when the user-selected gain value is equal to or greater than the threshold value.

3. (Original)   The computer program product of claim 2, wherein:

the threshold value is predetermined.

4. (Original)   The computer program product of claim 1, wherein:

step (c) includes the steps of

(i) determining the first portion to be equal to the user-selected gain value when the user-selected gain value is equal to or less than a threshold value, and

(ii) determining the first portion to be equal to the threshold value when the user-selected gain value is equal to or greater than the threshold value; and

step (d) includes the steps of

(i) determining the second portion to be equal to a no-change value when the user-selected gain value is equal to or less than a threshold value, and

3

Application No.: 09/682,071

(ii) determining the second portion to be equal to an excess of the user-selected gain value over the threshold value, when the user-selected gain value is greater than the threshold value.

5. (Original) The computer program product of claim 4, wherein:

the threshold value is predetermined.

6. (Original) The computer program product of claim 1, wherein the method further comprises the step of:

(e) receiving a calibration gain for a first of the one or more excitation sources, wherein the calibration gain is based, at least in part, on an output of the emission detector responsive to the first excitation source exciting a calibration source; and

(f) adjusting the first gain, the second gain, or both based, at least in part, on the calibration gain.

7. (Original) The computer program product of claim 6, wherein:

the calibration gain is based on a measurement that depends, at least in part, on the output of the emission detector.

8. (Original) The computer program product of claim 1, wherein:

the first user interface further is constructed and arranged to enable the user to associate the user-selected gain value with a first of the one or more excitation sources;

4

Application No.: 09/682,071

    step (b) further includes receiving from the first user interface the association of

the user-selected gain value with the first excitation source; and

    steps (c) and (d) are done when the first excitation source is operational.

9. (Original)   The computer program product of claim 8, wherein:

    the user associates the user-selected gain value with the first excitation source

based, at least in part, on identifying a scanning operation in which the first excitation

source is operational.

10. (Original) The computer program product of claim 1, wherein:

    the first user interface further is constructed and arranged to enable the user to

associate the user-selected gain value with a first of one or more emission labels;

    step (b) further includes receiving from the first user interface the association of

the user-selected gain value with the first emission label; and

    steps (c) and (d) are done when the first emission label is excited in a scanning

operation.

11. (Original) The computer program product of claim 1, wherein:

    the method further comprises the step of

        (e) providing a second user interface constructed and arranged to enable a

user to initiate a scanning operation; and

        step (b) further comprises the steps of

5

Application No.: 09/682,071

(i) receiving the user-selected gain value from the first user interface and

storing the user-selected gain value in a memory storage unit, and

(ii) retrieving the user-selected gain value from the memory storage unit

responsive to the user initiating a scanning operation.

12. (Original) The computer program product of claim 1, wherein:

the first and second user interfaces are included in a same user interface.

13. (Original) The computer program product of claim 1, wherein:

the emission detector includes a photomultiplier tube.

14. (Original) The computer program product of claim 1, wherein:

the first gain amplifies an emission signal based, at least in part, on emissions

from an emission label spatially associated with a probe of a probe array.

15. (Original) The computer program product of claim 14, wherein:

the probe array is a spotted probe array.

16. (Original) The computer program product of claim 14, wherein:

the probe array is a synthesized probe array.

17. (Original) A computer program product for adjusting the gain of a scanner having

one or more excitation sources, an emission detector having a first gain, and a variable

6

Application No.: 09/682,071

gain element having a second gain, wherein the computer program product, when executed on a computer system, performs a method comprising the steps of:

(a) receiving one or more user-selected gain values from one or more ranges of gain values;

(b) adjusting the first gain based, at least in part, on a first of the one or more user-selected gain values; and

(c) adjusting the second gain based, at least in part, on a second of the one or more user-selected gain values.

18. (Original) The computer program product of claim 17, wherein the method further comprises the steps of:

(d) receiving a calibration gain for a first of the one or more excitation sources, wherein the calibration gain is based, at least in part, on an output of the emission detector responsive to the first excitation source exciting a calibration source; and

(e) adjusting the first gain, the second gain, or both based, at least in part, on the calibration gain.

19. (Original) The computer program product of claim 17, wherein:

the user interface further is constructed and arranged to enable the user to associate the first user-selected gain value with a first of the one or more excitation sources;

step (a) further includes receiving from the user interface the association of the first user-selected gain value with the first excitation source; and

7

Application No.: 09/682,071

steps (b) and (c) are done when the first excitation source is operational.

20. (Original) A computer program product for adjusting the gain of a scanner having one or more excitation sources, an emission detector having a first gain, and a variable gain element having a second gain, wherein the computer program product, when executed on a computer system, performs a method comprising the steps of:

(a) receiving a user-selected gain value;

(b) adjusting the first gain based, at least in part, on a first portion of the user-selected gain value, including the steps of

(i) determining the first portion to be equal to a no-change value when the user-selected gain value is equal to or less than a threshold value, and

(ii) determining the first portion to be equal to an excess of the user-selected gain value over the threshold value, when the user-selected gain value is greater than the threshold value;

(c) adjusting the second gain based, at least in part, on a second portion of the user-selected gain value;

(d) receiving a calibration gain for a first of the one or more excitation sources, wherein the calibration gain is based, at least in part, on an output of the emission detector responsive to the first excitation source exciting a calibration source; and

(e) adjusting the first gain, the second gain, or both based, at least in part, on the calibration gain.

21. (Original) A gain adjustment system, comprising:

8

Application No.: 09/682,071

(a) a scanner having

(i) one or more excitation sources,

(ii) an emission detector having a first gain, and

(iii) a variable gain element having a second gain;

(b) a computer-implemented user interface constructed and arranged to enable a user to select a user-selected gain value; and

(c) scanner control and analysis control logic comprising

(i) a user-selected gain data manager constructed and arranged to receive the user-selected gain value, and

(ii) a scan gain controller constructed and arranged to adjust the first gain based, at least in part, on a first portion of the user-selected gain value, and to adjust the second gain based, at least in part, on a second portion of the user-selected gain value.

22. (Original) The system of claim 21, wherein:

the scan gain controller further is constructed and arranged to determine the second portion to be equal to the user-selected gain value, and the first portion to be a no-change value, when the user-selected gain value is equal to or less than a threshold value; and to determine the second portion to be equal to the user-selected gain value, and the first portion to be equal to an excess of the user-selected gain value over the threshold value, when the user-selected gain value is greater than the threshold value.

23. (Original) The system of claim 21, wherein:

9

Application No.: 09/682,071

the scan gain controller further is constructed and arranged to determine the first

portion to be equal to the user-selected gain value, and the second portion to be a no-

change value, when the user-selected gain value is equal to or less than a threshold value;

and to determine the first portion to be equal to the user-selected gain value, and the

second portion to be equal to an excess of the user-selected gain value over the threshold

value, when the user-selected gain value is greater than the threshold value.

24. (Original) The system of claim 21, wherein:

the scan gain controller further is constructed and arranged to receive a calibration

gain for a first of the one or more excitation sources, wherein the calibration gain is

based, at least in part, on an output of the emission detector responsive to the first

excitation source exciting a calibration source; and to adjust the first gain, the second

gain, or both based, at least in part, on the calibration gain.

25. (Original) A method for adjusting the gain of a scanner having one or more

excitation sources, an emission detector having a first gain, and a variable gain element

having a second gain, comprising the steps of:

(a) receiving a user-selected gain value;

(b) adjusting the first gain based, at least in part, on a first portion of the user-

selected gain value; and

(c) adjusting the second gain based, at least in part, on a second portion of the

user-selected gain value.

10

Application No.: 09/682,071

26. (Original) The method of claim 25, wherein:

steps (b) and (c) include the step of allocating the user-selected gain between the

first and second portions based, at least in part, on one or more operational characteristics

of the emission detector.

27. (Original) The method of claim 26, wherein:

the operational characteristics include signal to noise ratio.

28. (Original) A computer program product for adjusting the gain of a scanner having

one or more excitation sources, an emission detector having a first gain, and a variable

gain element having a second gain, wherein the computer program product, when

executed on a computer system, performs a method comprising the steps of:

(a) selecting an auto-gain value;

(b) adjusting the first gain based, at least in part, on a first portion of the auto-gain

value;

(c) adjusting the second gain based, at least in part, on a second portion of the

auto-gain value;

(d) causing the scanner to collect a plurality of sample pixel intensity values using

the adjusted first and second gains;

(e) determining a comparison measure based on comparing one or more of the

plurality of sample pixel intensity values to one or more of a plurality of desired pixel

intensity values; and

(f) adjusting the auto-gain value based on the comparison measure.

11

Application No.: 09/682,071

29. (Original) The computer program product of claim 28, wherein:

steps (b) through (f) are repeated until the comparison measure reaches an

acceptance value or range, or until a number of repetitions exceeds an attempt number.

30. (Original) The computer program product of claim 29, wherein:

the acceptance value or range, the attempt number, or both are user selected.

31. (Original) The computer program product of claim 29, wherein:

the acceptance value or range, the attempt number, or both are predetermined.

32. (Original) The computer program product of claim 29, wherein:

the acceptance value or range, the attempt number, or both are calculated.

33. (Original) The computer program product of claim 28, wherein:

the comparison measure includes a histogram of the plurality of sample pixel

intensity values.

34. (Original) The computer program product of claim 33, wherein:

the comparison measure includes a ratio between a first portion of the plurality of

sample pixel intensity values in a first number of bins of the histogram and a second

portion of the plurality of sample pixel intensity values in a second number of bins of the

histogram.

12

Application No.: 09/682,071

35. (Original) The computer program product of claim 28, wherein:

   the comparison measure includes a statistical measure.

36. (Original) The computer program product of claim 35, wherein:

   the statistical measure includes a mean or average of two or more of the plurality

of sample pixel intensity values.

37. (Original) The computer program product of claim 28, wherein:

   the first gain amplifies an emission signal based, at least in part, on emissions

from an emission label spatially associated with a probe of a probe array; and

38. (Original) The computer program product of claim 37, wherein:

   the probe array is a spotted probe array.

39. (Original) The computer program product of claim 37, wherein:

   the probe array is a synthesized probe array.

40. (Original) The computer program product of claim 37, wherein:

   the plurality of desired pixel intensity values is determined based, at least in part,

on an expected ratio of background pixels on the probe array to probe pixels on the probe

array.

13

Application No.: 09/682,071

41. (Original) The computer program product of claim 28, wherein:

    step (b) includes the steps of

        (i) determining the first portion to be equal to a no-change value when the auto-gain value is equal to or less than a threshold value, and

        (ii) determining the first portion to be equal to an excess of the auto-gain value over the threshold value, when the auto-gain value is greater than the threshold value; and

    step (c) includes the steps of

        (i) determining the second portion to be equal to the auto-gain value when the auto-gain value is equal to or less than a threshold value, and

        (ii) determining the second portion to be equal to the threshold value when the auto-gain value is equal to or greater than the threshold value.

42. (Original) The computer program product of claim 41, wherein:

    the threshold value is predetermined.

43. (Original) The computer program product of claim 28, wherein the method further comprises the step of:

    (g) receiving a calibration gain for a first of the one or more excitation sources, wherein the calibration gain is based, at least in part, on an output of the emission detector responsive to the first excitation source exciting a calibration source; and

    (h) adjusting the first gain, the second gain, or both based, at least in part, on the calibration gain.

14

Application No.: 09/682,071

44. (Original) The computer program product of claim 28, wherein:

the emission detector includes a photomultiplier tube.

45. (Original) A gain adjustment system, comprising:

(a) a scanner having

(i) one or more excitation sources,

(ii) an emission detector having a first gain, and

(iii) a variable gain element having a second gain; and

(b) scanner control and analysis control logic comprising a scan gain controller

constructed and arranged to

(i) select an auto-gain value,

(ii) adjust the first gain based, at least in part, on a first portion of the auto-

gain value;

(iii) adjust the second gain based, at least in part, on a second portion of

the auto-gain value;

(iv) cause the scanner to collect a plurality of sample pixel intensity values

using the adjusted first and second gains;

(v) determine a comparison measure based on comparing one or more of

the plurality of sample pixel intensity values to one or more of a plurality of desired pixel

intensity values; and

(vi) adjust the auto-gain value based on the comparison measure.

15

Application No.: 09/682,071

46. (Original) A method for adjusting the gain of a scanner having one or more

excitation sources, an emission detector having a first gain, and a variable gain element

having a second gain, comprising the steps of:

  (a) selecting an auto-gain value;

  (b) adjusting the first gain based, at least in part, on a first portion of the auto-gain

value;

  (c) adjusting the second gain based, at least in part, on a second portion of the

auto-gain value;

  (d) causing the scanner to collect a plurality of sample pixel intensity values using

the adjusted first and second gains;

  (e) determining a comparison measure based on comparing one or more of the

plurality of sample pixel intensity values to one or more of a plurality of desired pixel

intensity values; and

  (f) adjusting the auto-gain value based on the comparison measure.

47. (Original) The method of claim 46, wherein:

  steps (b) and (c) include the step of allocating the auto-gain between the first and

second portions based, at least in part, on one or more operational characteristics of the

emission detector.

48. (Original) The method of claim 47, wherein:

  the operational characteristics include signal to noise ratio.

16

Application No.: 09/682,071

49-53 (Cancelled)

17